WHAT IS CLAIMED IS:

1. An optically-pumped laser device, comprising:

a nonionic base layer; and

an ionic layer attached to said nonionic base layer through an optical-quality interface, a cross-section through said device in a direction perpendicular to said interface having a trapezoidal shape.

2. The laser device of claim 1, wherein said optical-quality interface is a diffusion-bonded interface.

3. The laser device of claim 1, wherein said optical-quality interface is a layer-growth type interface.

4. The laser device of claim 1, wherein all cross-sections passing through said optical-quality interface in a direction perpendicular to said interface have a trapezoidal shape.

5. The laser device of claim 1, wherein said nonionic layer and said ionic layer form a laser slab, said laser slab having a bottom surface and two side surfaces, an angle between said side surfaces and said bottom surface being about 60°.

6. The laser device of claim 1, wherein said nonionic layer is a YAG layer and said ionic layer is a Yb:YAG layer having a ytterbium concentration of about 15%.

7. The laser device of claim 1, wherein said nonionic layer has a thickness of about 3.25 mm and said ionic layer has a thickness of about 0.25 mm.

8. The laser device of claim 1, wherein said ionic layer has an isolation groove.

9. A method for producing laser light output, comprising:

providing a laser slab having a nonionic layer and an ionic layer attached thereto via an optical-quality interface, a cross section through said nonionic layer of said laser slab in a direction perpendicular to said interface having a trapezoidal shape producing a bottom surface on said nonionic layer having an enlarged area relative to a top surface on said ionic layer; and

pumping said bottom surface of said laser slab with input light from a diode array.

10. The method of claim 9, wherein providing a laser slab includes providing a laser slab with the nonionic layer comprising YAG material and the ionic layer comprising Yb:YAG material.

11. The method of claim 10, wherein pumping said laser slab with input energy from a diode array includes pumping said laser slab with pulsed light having a wavelength of about 940 nm.

12. The method of claim 11, wherein said pulsed light has a peak optical power of at least about 400 W.

13. The method of claim 10, wherein pumping said laser slab with input light from a diode array includes pumping said laser slab with continuous light having a wavelength of about 940 nm.

14. The method of claim 13, wherein said continuous light has a peak optical power of at least about 240 W.

15. The method of claim 9, wherein providing a laser slab includes providing a laser slab with an ionic layer having an isolation groove.

16. The method of claim 9, wherein providing a laser slab includes providing a laser slab having a trapezoidal cross section through both said nonionic layer and said ionic layer in a direction perpendicular to said interface.

17. An optically-pumped laser slab, comprising:

a YAG layer; and

a Yb:YAG layer attached to said YAG layer along optical-quality interface by diffusion bonding, said Yb:YAG layer having a ytterbium concentration of approximately 15%, a cross section through said laser slab in any plane perpendicular to said optical-quality interface having a trapezoidal shape, said laser slab having a bottom surface and two side surfaces tilted inwardly from the bottom surface at an angle of about 60°.

18. A method of manufacturing a laser device, comprising:

providing a nonionic layer having a bottom surface;

providing an ionic layer;

connecting the ionic layer and the nonionic layer through an optical quality interface with said nonionic layer at a position opposite said bottom surface of said nonionic layer; and

polishing at least two lateral surfaces of said nonionic layer and said ionic layer to form side surfaces, said polishing being at an angle to said optical quality interface so that a cross-section through the ionic layer and the nonionic is trapezoidal in shape, with said bottom surface of said nonionic layer having a greater surface area than said optical quality interface.

19. The method of claim 18, wherein said polishing is at an angle of approximately 60° from the optical quality interface.

20. The method of claim 18, wherein fabricating a nonionic layer comprises fabricating a YAG layer.

21. The method of claim 20, wherein fabricating an ionic layer comprises fabricating a Yb:YAG layer.

22. The method of claim 20, wherein said polishing includes polishing such that said bottom surface of said nonionic layer has a surface area approximately 3 times greater than a surface area of said optical quality interface.

23. The method of claim 18, wherein fabricating an ionic layer includes fabricating an isolation groove in said ionic layer.

24. The method of claim 18, wherein said steps of providing an ionic layer and connecting the ionic layer to the nonionic layer take place simultaneously through epitaxial growth.

25. The method of claim 18, wherein said step of connecting the ionic layer to the nonionic layer includes connecting through diffusion bonding.

26. A laser slab for use in an optically-pumped laser, comprising:

a nonionic layer having a bottom surface and side surfaces; and

an ionic layer attached to said nonionic layer along an interface, the bottom surface of said nonionic layer having a bottom surface area greater than an interface surface area of said interface, said side surfaces of said nonionic layer funneling optical energy from said bottom surface of said nonionic layer to said interface.

27. The laser slab of claim 26, wherein said surface area of said bottom surface is at least about two times greater than said interface surface area.

28. The laser slab of claim 26, wherein a cross-section through said nonionic layer in a direction perpendicular to said interface is trapezoidal.

29. The laser slab of claim 26, wherein said side walls are so shaped as to provide rounded profiles in a cross-section in a direction perpendicular to said interface.

30. The laser slab of claim 26, wherein said side walls are so shaped as to provide parabolic profiles in a cross-section in a direction perpendicular to said interface.

31. The laser slab of claim 26, wherein said ionic layer has an isolation groove.